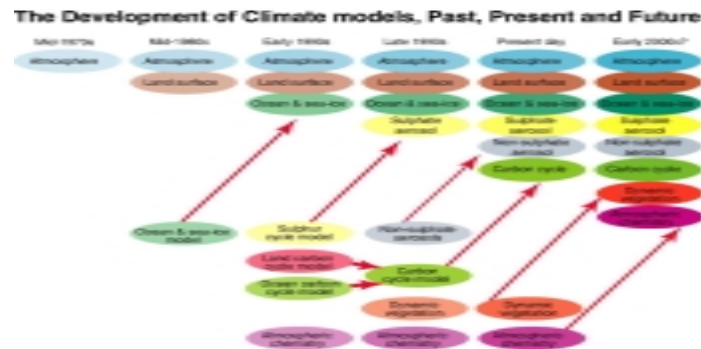
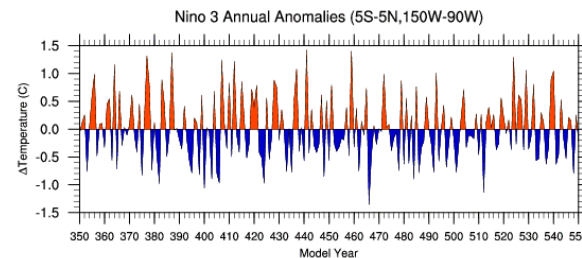
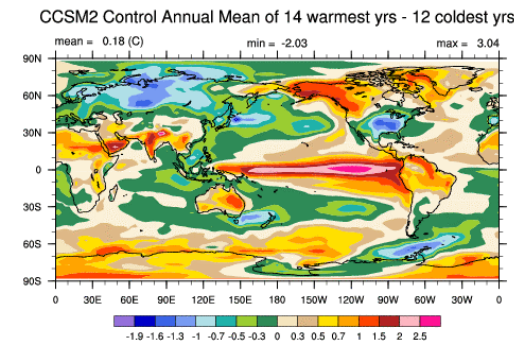


# SC02 BOF on the Earth Simulator

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# Why Climate Prediction is Compute Limited

- Long time integrations:
  - Historical validation 1870-2000
  - Future scenarios 2000-2200
- Comprehensive, coupled processes
  - Models still under development
  - Nonlinear feedbacks and sensitivities
- Multi-scale interactions
- Need for ensemble forecasts
- Decision support scenarios



# Earth Simulator Class Computing

- Will enable
  - Additional atmospheric chemistry
    - Tropospheric
    - Stratospheric
  - Interactive land and biogeochemistry
  - Comprehensive carbon cycle models
  - Increased resolution
    - Atm 30 km
    - Ocn 1/10 degree
    - Lnd 1 km
  - Better throughput for coupled models



# Effect of ESS on Hardware and Software Issues

- Challenges assumptions
  - *Capability* computing versus *capacity* computing
  - “software is the issue”
  - Any code can be made to run fast on any machine. If not, change the algorithm.
  - Special purpose processors and vector supercomputers have run out of steam
  - Price - performance ratio
  - Mass market business model.
- Assertions
  - *Vector* versus *cache* is not the issue
  - Effective bandwidth and latency of memory subsystem and interconnect are key
  - Performance portability among platforms is possible
  - High percentage of peak indicates a balanced system

# Are We in a Race?

- What will advance science?
  - Sustained commitment and plan for
    - Application science
    - Methods research and software development
    - Hardware deployment and research
  - Access to ESS Class capability computing for
    - model development
    - production
  - Attention to application performance